Nursing Management

Systems thinking

PATIENT SAFETY

Using systems thinking in patient safety: a case study on medicines management

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Abstract

Systems thinking is used as a way of understanding behaviours and actions in complex healthcare organisations. An important premise of the concept is that every action in a system causes a reaction elsewhere in that system. These reactions can lead to unintended consequences, sometimes after the original action, and are therefore not always attributed to them. This article applies systems thinking to a medicines management case study, to highlight how quality improvement practitioners can use the approach to underpin planning and implementation of patient safety initiatives. The case study is specific to transcribing in children's hospices, but the strategies can be applied to other areas. The article explains that while root cause analysis tools are useful for identifying the cause of, and possible solutions to, problems, they need to be considered carefully in terms of unintended consequences, and how the system into which the solution is implemented may

be affected by the change. Analysis of problems using a systems-thinking approach can help practitioners to develop robust and well-informed business cases to present to decision makers.

medicines management, nursing management, patient safety, systems thinking, transcribing, unintended consequences, wicked issues

Introduction

Patient safety, defined as 'avoiding harm to patients from the care that is intended to help them', is an essential component of quality in health care (Institute of Medicine (IOM) 2001) (Figure 1).

Prevention of medicines management errors, defined by the European Medicines Agency (EMA) (2015) as 'an unintended failure in the drug treatment process that leads to, or has the potential to lead to, harm to the patient', is a vital part of ensuring patient safety. Failures resulting in medicines management errors, for example during prescribing or administration, are caused mainly by human factors (Department of Health (DH) 2000), and can have significant human, organisational, and financial costs (Frontier Economics 2014).

Medicines management errors are the most common preventable sources of adverse incidents (EMA 2015), with one in ten episodes of medication administration, in England and Wales, resulting in an error (National Patient Safety Agency 2007). As well as being harmful to patients, these errors can be stressful for the administering person (Fisher and Scott 2013). Although it is not possible to eradicate errors totally, the consequences can be minimised by systems that tolerate inevitable human errors, and contain their effects (DH 2000).

This article uses a case study to critically explore, and demonstrate learning from, a patient safety incident related to medicines management.

Figure 1. Six dimensions of quality

(Institute of Medicine 2001)

Case study

The practice setting is a children's hospice, where children with life-limiting conditions are cared for. Children's hospices function differently to adult hospices, in that their primary provision is respite or short-break care. In this hospice, planned admissions for short-break care are on Mondays and Fridays, and children are accompanied by their parents/carers throughout the admission process, which can take up to two hours. These are busy days, as the admissions and discharges often take place in close proximity, both in time and space.

Admissions include transcription of medications, routinely taken by the children, onto the hospice's drug charts. Most children have complex drug regimens, which requires a registered nurse (RN) to take time and concentrate to ensure the transcription is accurate. Completed transcriptions are checked by another RN, who is usually admitting a different patient at the same time, and there are additional time pressures on staff, for example if parents/carers need to leave quickly to attend to other commitments. As a result of these factors, high levels of medicines management errors and near misses, due to incorrect transcriptions, were a long-standing issue at the hospice. An Ishikawa diagram (Figure 2) summarises the factors that contributed to the errors.

A newly promoted manager decided to introduce a different process to try to address the transcribing problems. Patients were admitted as usual, but transcriptions were assigned to two RNs who were not involved in admissions, and were located in a separate room to avoid interruptions. As one RN completed a transcription, the other checked it. Following implementation of the new system there were no drug errors or near misses which could be attributed to transcription mistakes, and it was therefore regarded as a success.

However, after the new system was implemented several healthcare support workers raised concerns that fewer RNs were available on admission days to provide advice or assistance. These concerns were initially dismissed because of the effectiveness of the new transcribing system in ensuring patient safety. However, an increased incidence of non-medicine related adverse events on admission days were noted over time. Some were errors or omissions, others were episodes of

suboptimal care due to lack of staff, for example a child who required two staff to assist with bathing or changing waiting a long time, sometimes in soiled clothing.

The rest of this article critically explores the case study to try to understand, and address, the complexities of changing nursing practice, and to illustrate how successful changes in one area can result in unintended difficulties elsewhere in an organisation.

Figure 2. Ishikawa diagram of transcribing errors - manager's perspective

Transcribing

The Nursing and Midwifery Council (NMC) Standards for Medicines Management (2010) define transcription as 'Any act by which medicinal products are written from one form of direction to administer to another…', while transcription errors are 'any deviation from the initial prescription or medication order' (Slight et al 2014). Although the NMC (2010) states that transcribing should only occur in exceptional circumstances, it also recognises that it happens routinely in children's hospices, and directs registrants to Health Care Commission (HCC) guidance. However, when the HCC was subsumed by the Care Quality Commission (CQC), the guidance was archived and is difficult to locate, illustrated by Freedom of Information request number 0562 (CQC 2013), so essentially there is no readily accessible guidance from this source.

Transcribing in children's hospices is recognised as problematic, and the National Institute for Health and Care Excellence (NICE) is extending its guidance on medicines management in care homes, the category under which children's hospices sit (NICE 2014a), through a parent-held medicines record for children with complex conditions (NICE 2014b). This document will provide the information necessary for transcription as medication labels, which are the usual source of transcription information, are easily damaged and may be outdated (Together for Short Lives (TfSL) 2014).

In the future, an electronic system, where barcodes on medication packets and bottles are scanned and printed onto drug charts, might be possible. This technology can eliminate transcription errors (Poon et al 2010), but is available mainly in the US (Burnham 2012). However, scanning barcodes does not rule out community pharmacy transcription errors, known as transposing (NMC 2010), which is the most common reason for dispensing errors (Knudsen et al 2007).

Transcription as a complex quality and safety issue

Transcription is not a routine activity in hospitals, therefore transcription errors are not regarded as a major cause of preventable adverse drug events (van Doormaal et al 2009). However, this does not apply to children's hospices (TfSL 2014), which are increasing in the UK and worldwide (Boucher 2012). Transcribing is the 'norm' rather than the exception in children's hospices, and can be more chaotic and vulnerable to error than in other clinical areas, due to the unique philosophy of care. For example, the underpinning philosophy of children's hospices is to be 'homely' and welcoming spaces, so most areas are accessible, and simultaneously populated by staff, parents, grandparents, children, siblings and visitors.

At the children's hospice in the case study, admissions take place in the communal dining area. This area is frequented by several family members and staff during mealtimes, which often overlap with admission times, and is used for play activities, and is the thoroughfare between the bedrooms and reception. Therefore, interruptions were frequent which resulted in transcription errors.

The Swiss Cheese model (Reason 1990, 2010) is useful for illustrating how transcription errors led to medicines management errors in the original system (Figure 3), and how the new system prevented them (Figure 4).

The model shows how countermeasures can 'defend' against human factors. Errors occur when circumstances cause the holes in the slices of cheese (defences) to align, and are prevented when systems designed to defend against safety hazards work correctly, making the line of defence impenetrable.

However, the model also illustrates the conflict between maintaining certain aspects of quality, and upholding safety (Vincent 2010. In this instance, the quality of patients' experiences, that is a 'homely' and 'patient-centred' environment, was maintained initially, to the unintentional detriment of other quality indicators, such as efficient, timely and safe transcriptions. In other words, the attempt to increase safety through partially restricting the movement of, and interaction between, patients and their families during transcribing could be interpreted as diminishing patient- and family-centred care.

The case study demonstrates how an understanding of complexity, and complex systems, can benefit those who are managing relatively small changes in nursing practice. Planning change, while considering some simple rules from systems thinking, can help avoid the situation described, where a positive change in one area of practice can be offset by less positive changes in another.

Figure 3. How transcription errors led to medicines management errors in the original system

Figure 4. How the new system of transcribing prevented errors

Systems thinking, unintended consequences, and balancing measures

Systems thinking is used as a way of understanding behaviours and actions in complex healthcare organisations (Health Foundation 2010), and is regarded by some authors as the preferred approach to managing resources (Adam 2014, Peters 2014, Russell et al 2014). An important premise of systems thinking is that every action within a system causes a reaction elsewhere in the system (Iles and Sutherland 2001). As illustrated by the case study, these reactions can lead to unintended consequences, which can happen sometime after the original action (Senge 1990) and are therefore not always attributed to them (Goodwin et al 2006).

The concept of unintended consequences has long been discussed in social sciences, and is often used to understand and plan change in complex organisations. Defined as outcomes that are not the ones that are foreseen and intended by a powerful action (Merton 1936), unintended consequences can be categorised as resulting in unexpected benefits, or in unexpected drawbacks. In the case study, the unintended consequences were drawbacks, as resourcing decisions about RN allocation had negative knock-on effects elsewhere in the system.

Improvement science has identified the need to capture such unintended consequences. For example, the King's Fund (Ham et al 2016) suggests improvement projects should not only focus on measuring direct outcomes of improvement ideas, in this case reduction of transcription errors, but also on 'balancing measures', which consider the effects of improvements elsewhere in the wider system. Consideration of the broader effects of redistributing RNs on admission/discharge days might have identified the negative effects of work left undone because of nurse shortages in certain areas.

Critically analysing the change: the case for 'wicked issues' and 'system archetypes'

All systems are interrelated, therefore even strategies put in place to counteract anticipated consequences can cause their own effects. For example, if the manager had anticipated the consequences of removing staff from the unit, and counteracted this by rostering additional staff, it might have affected the number of nurses available to work other shifts.

The concept of 'wicked problems' has recently emerged in social sciences as a way of explaining the intractable nature of certain problematic issues in complex systems. First identified by Rittel and Weber (1973), the concept suggests that some problems evade simple understanding and solutions, unlike 'tame problems' that often have clear cause-effect relationships, and are readily solvable. Therefore, when a proposed solution to a wicked problem is implemented it might resolve some aspects, but other, previously unidentified, problems can then emerge that require further resolution.

Looked at in this way, wicked problems can never be completely solvable. Instead solutions can only be seen to make things better or worse, or sometimes better and worse at the same time. The effect of presenting 'tame solutions' to wicked problems is illustrated in the case study, where initial success was undermined, at a later stage, by emergent, related problems elsewhere in the system.

Another concept that offers a useful critical lens through which to analyse change and unintended consequences is 'system archetypes' (Senge 1990), highly effective tools for gaining insight into patterns of behaviour, and which reflect the underlying structures of the system studied. Archetypes can be useful for planning change, and for answering questions about organisational safety culture, by helping to clarify why safety-related decisions do not always result in the desired behaviours, and how undesired side effects arise from apparently good decisions (Marais et al 2006). One particular archetype, 'fixing symptoms rather than root causes', is described below.

A 'fix' is implemented in response to a safety problem, temporarily reducing the problem's symptoms. However, the fix does not eliminate the deeper structural deficiencies, or the root cause of the problem, that led to the incident in the first place and may lead to other incidents in the future. Additionally, solutions that only address the symptoms, rather than causes, of problems might, in the short to medium term, create the illusion that there is no problem, which will diminish the overall safety of an organisation. Eliminating root causes is likely to be more time-consuming, expensive and difficult to implement than applying symptomatic solutions (Marais et al 2006).

Addressing root causes

Having recently been promoted, the manager in the case study might have focused on day-to-day events rather than taking a more strategic perspective, which has, historically, been nurses' approach to patient safety initiatives (Mitchell 2008). The manager drew on the resources available to her to manage the symptoms of the problem, but could not influence overall staffing levels directly, which was an important root cause. Another root cause, the complex, error-inducing admissions logistics, could have been addressed without financial consequences, but would have required approval to change operational policies and procedures, and possibly a perceived shift away from the hospice's patient-centred values.

One of the most obvious strategies is to prevent overlaps by enforcing discharge and admission times. However, the demands of caring for children with complex needs, and other family commitments, means that adhering to strict timetables is difficult for parents. Further, admonishing families for not adhering to timelines is contrary to the hospice's philosophy, and seems petty in the circumstances. This is another example of where quality (of experience) and safety are not interwoven (Vincent 2010), as one directly compromises, rather than improves, the other.

At present, the manager is restricted by the long-standing pattern of admissions on Mondays and Fridays, which was established when the hospice first opened on a Monday to Friday. When provision was extended to seven days, weekend stays (Friday till Monday) were added to the pattern of Monday-to-Friday stays. Despite the pressure this puts on staffing, bedroom turnaround and management of complicated admissions, the pattern remains unchanged.

There are feasible solutions, for example spreading admissions and discharges over seven days, or discharging in the late afternoon/early evening, and admitting early to mid-morning, would eliminate overlap. However, since families are allocated short breaks at least six months in advance, implementation of staggered admissions would need to be incremental. This change would need to be piloted, followed by consultation with staff, children and their families, before deciding on a final strategy, which would also require review. One potential problem is managing families' expectations, as they are accustomed to the present system, therefore a period of normalisation would be required (May 2013), during which the new system would be formalised by policy, and monitored by audit.

Summary and recommendations

The application of systems thinking (Senge 1990) to a medicines management scenario illustrates how quality improvement practitioners can use the approach to underpin planning and implementation of patient safety

initiatives. Although the scenario is specific to transcribing in children's hospices, the strategies can be applied to other areas.

The discussion illustrates that while tools such as the Swiss Cheese (Reason 1990, 2010) and Ishikawa (1990) diagrams are useful for identifying the cause of problems, and generating possible solutions, they need to be considered carefully in terms of unintended consequences, and how the system in which the solution is implemented might be affected by the change.

Further, staff leading on quality improvement projects must be mindful that 'fixing' symptoms does not address root causes, and that improvement projects can overlook, or not attempt to address, root causes beyond their sphere of influence. Analysis of problems using systems thinking is a helpful way of developing robust and well-informed business cases to present to those who make decisions about financial investments or policy changes.

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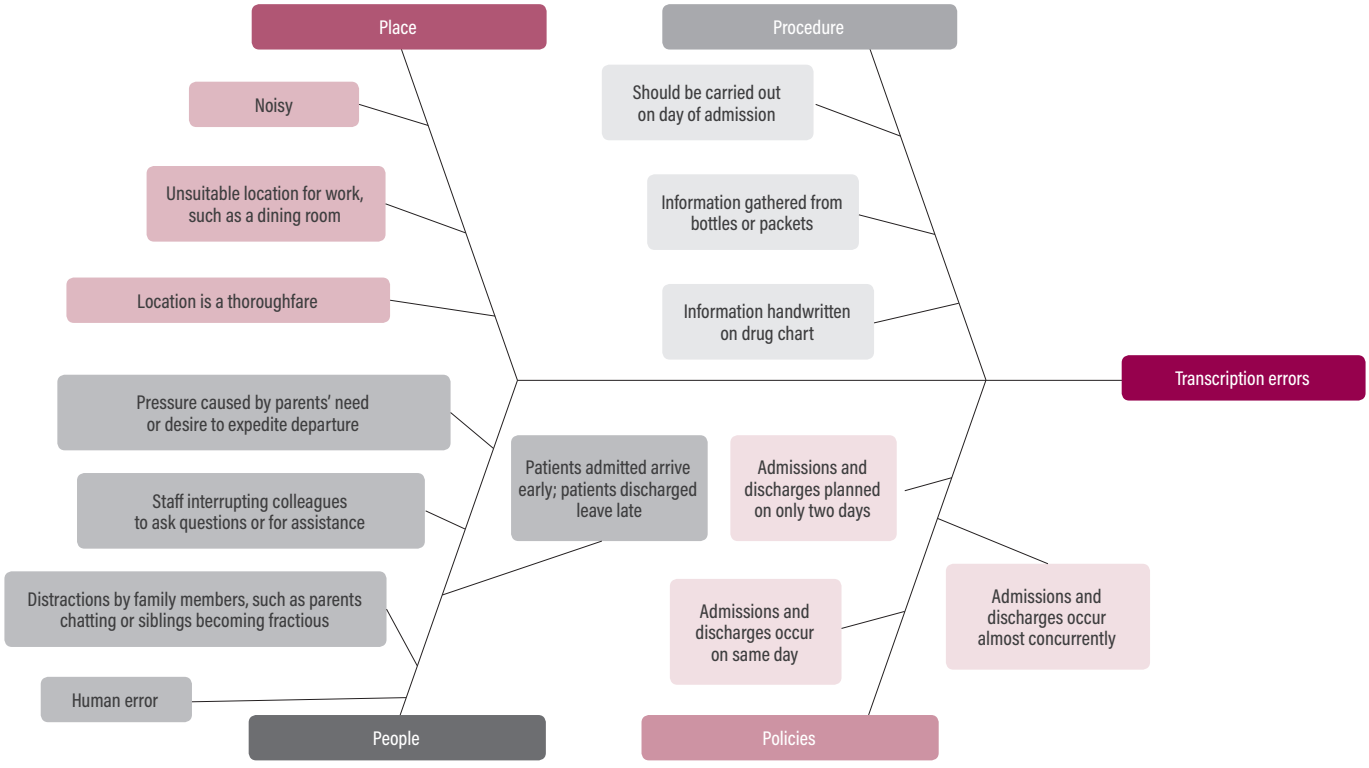
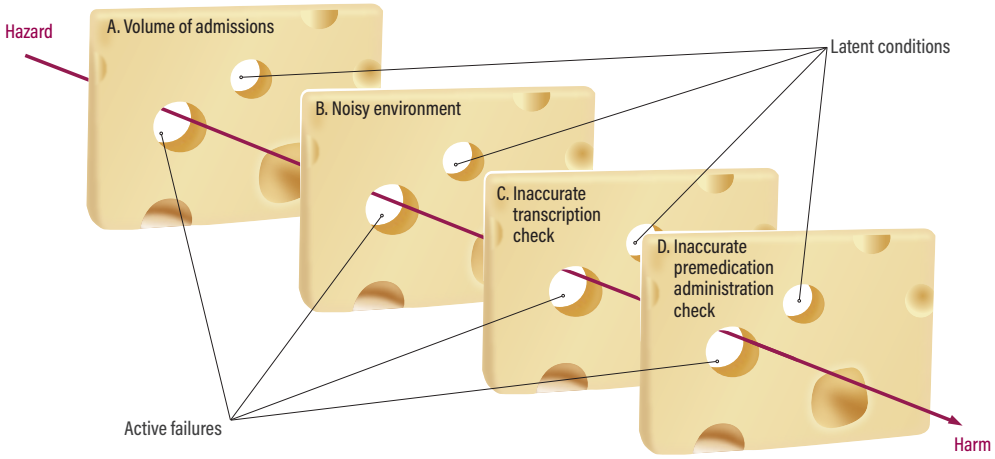
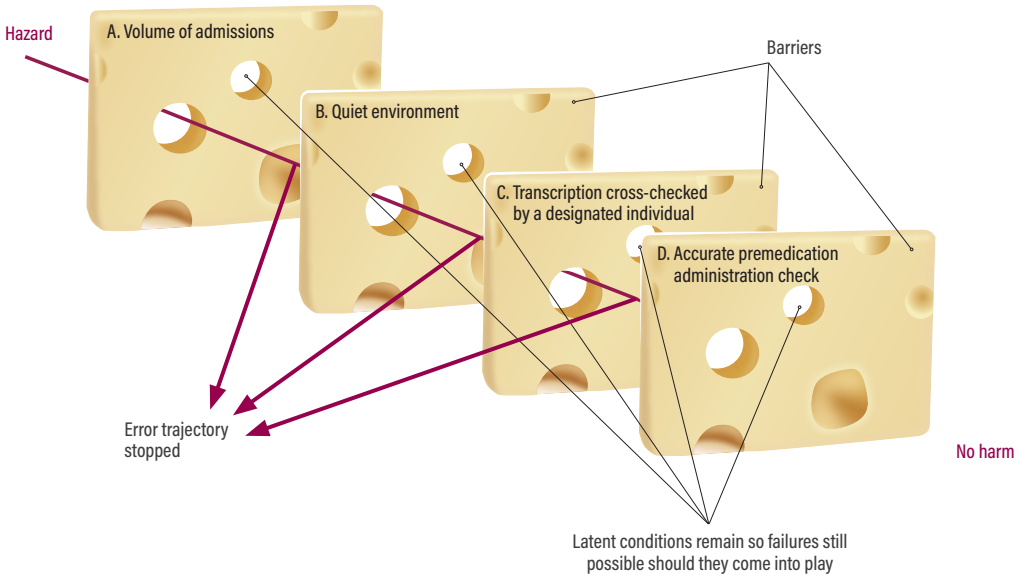
EFFECTIVE
EFFICIENT
SAFE
TIMELY
PATIENT CENTRED
EQUITABLE
QUALITY


Transcription errors
Place
Noisy
Unsuitable location for work, such as a dining room
Location is a thoroughfare
Pressure caused by parents' need or desire to expedite departure
Staff interrupting colleagues to ask questions or for assistance
Distractions by family members, such as parents chatting or siblings becoming fractious
Human error
People
Procedure
Should be carried out on day of admission
Information gathered from bottles or packets
Information handwritten on drug chart
Patients admitted arrive early; patients discharged leave late
Admissions and discharges planned on only two days
Admissions and discharges occur on same day
Admissions and discharges occur almost concurrently
Policies


Hazard
A. Volume of admissions
Latent conditions
B. Noisy environment
C. Inaccurate transcription check
D. Inaccurate premedication administration check
Active failures
Harm


Hazard
A. Volume of admissions
Barriers
B. Quiet environment
C. Transcription cross-checked by a designated individual
D. Accurate premedication administration check
Error trajectory stopped
No harm
Latent conditions remain so failures still possible should they come into play